

AMENDMENTS TO THE CLAIMS

Claim 1 (Original): A resin composition comprising 70 to 99.9% by weight of ethylene-vinyl alcohol copolymer (A) and 0.1 to 30% by weight of a thermoplastic resin (B) other than the ethylene-vinyl alcohol copolymer (A), wherein

an ethylene content ETa (mol%) and a degree of saponification SDa (%) of the ethylene-vinyl alcohol copolymer (A) satisfy the following equations (1) and (2):

$$25 \leq \text{ETa} \leq 55 \quad (1)$$

$$90 \leq \text{SDa} < 99 \quad (2), \text{ and}$$

an oxygen absorption rate of the resin composition is $0.01 \text{ ml/m}^2 \cdot \text{day}$ or more.

Claim 2 (Original): A resin composition comprising 70 to 99.9% by weight of ethylene-vinyl alcohol copolymer (A) and 0.1 to 30% by weight of a thermoplastic resin (B) other than the ethylene-vinyl alcohol copolymer (A), wherein

the ethylene-vinyl alcohol copolymer (A) comprises at least two kinds of ethylene-vinyl alcohol copolymers (a1) and (a2),

ethylene contents ETa1 (mol%) and ETa2 (mol%) and degrees of saponification SDa1 (%) and SDa2 (%) of the ethylene-vinyl alcohol copolymers (a1) and (a2), respectively, satisfy the following equations (3) to (6):

$$25 \leq \text{ETa1} \leq 55 \quad (3)$$

$$90 \leq \text{SDa1} < 99 \quad (4)$$

$$25 \leq \text{ETa2} \leq 55 \quad (5)$$

$$99 \leq \text{SDa2} \quad (6),$$

a weight ratio (a1/a2) of the ethylene-vinyl alcohol copolymers (a1) and (a2) is 5/95 to 95/5, and

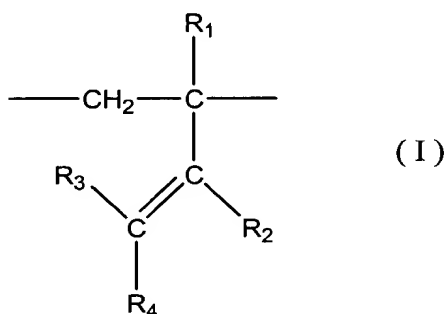
an oxygen absorption rate of the resin composition is $0.01 \text{ ml/m}^2 \cdot \text{day}$ or more.

Claim 3 (Original): The resin composition of claim 2, wherein the thermoplastic resin (B) comprises a carbon-carbon double bond.

Claim 4 (Currently Amended): The resin composition of ~~any one of~~ claim 2, further ~~comprises~~ comprising a transition metal salt (C).

Claim 5 (Original): The resin composition of claim 2, wherein the thermoplastic resin (B) comprises a carbon-carbon double bond in a ratio of 0.0001 eq/g or more.

Claim 6 (Original): The resin composition of claim 2, wherein the thermoplastic resin (B) comprises a unit represented by formula (I)



wherein R₁ is a hydrogen atom or an alkyl group having 1 to 5 carbon atoms, R₂ is a hydrogen atom, an alkyl group having 1 to 10 carbon atoms, an aryl group, an alkylaryl group, an arylalkyl group or an alkoxy group, R₃ and R₄ are each independently a hydrogen atom, an alkyl group having 1 to 10 carbon atoms, an aryl group that can be substituted, -COOR₅, -OCOR₆, an cyano group or a halogen atom, and R₅ and R₆ are each independently an alkyl group having 1 to 10 carbon atoms, an aryl group, an alkylaryl group, an arylalkyl group or an alkoxy group.

Claim 7 (Currently Amended): The resin composition of claim 2, wherein a number average molecular weight of the thermoplastic resin (B) is 1000 to 500000.

Claim 8 (Original): The resin composition of claim 2, wherein the thermoplastic resin (B) comprises an aromatic vinyl compound unit and a diene compound unit.

Claim 9 (Original): The resin composition of claim 8, wherein the diene compound unit is at least one of an isoprene unit and a butadiene unit.

Claim 10 (Original): The resin composition of claim 8, wherein the aromatic vinyl compound unit is a styrene unit.

Claim 11 (Original): The resin composition of claim 8, wherein the thermoplastic resin (B) is a block copolymer.

Claim 12 (Original): The resin composition of claim 2, wherein the thermoplastic resin (B) is a styrene-isoprene block copolymer.

Claim 13 (Original): The resin composition of claim 2, wherein a difference in refractive index between the ethylene-vinyl alcohol copolymer (A) and the thermoplastic resin (B) is 0.01 or less.

Claim 14 (Original): The resin composition of claim 2, wherein particles of the thermoplastic resin (B) are dispersed in a matrix of the ethylene-vinyl alcohol copolymer (A).

Claim 15 (Original): A resin composition comprising ethylene-vinyl alcohol copolymer (A), a thermoplastic resin (B) other than the ethylene-vinyl alcohol copolymer (A), and a transition metal salt (C), wherein

an ethylene content ETa (mol%) and a degree of saponification SDa (%) of the ethylene-vinyl alcohol copolymer (A) satisfy the following equations (1) and (2):

$$25 \leq \text{ETa} \leq 55 \quad (1)$$

$$90 \leq \text{SDa} < 99 \quad (2), \text{ and}$$

the thermoplastic resin (B) comprises a carbon-carbon double bond.

Claim 16 (Original): A resin composition comprising ethylene-vinyl alcohol copolymer (A), a thermoplastic resin (B) other than the ethylene-vinyl alcohol copolymer (A), and a transition metal salt (C), wherein

the ethylene-vinyl alcohol copolymer (A) comprises at least two kinds of ethylene-vinyl alcohol copolymers (a1) and (a2),

ethylene contents ETa1 (mol%) and ETa2 (mol%) and degrees of saponification SDa1 (%) and SDa2 (%) of the ethylene-vinyl alcohol copolymers (a1) and (a2), respectively, satisfy the following equations (3) to (6):

$$25 \leq \text{ETa1} \leq 55 \quad (3)$$

$$90 \leq \text{SDa1} < 99 \quad (4)$$

$$25 \leq \text{ETa2} \leq 55 \quad (5)$$

$$99 \leq \text{SDa2} \quad (6),$$

a weight ratio (a1/a2) of the ethylene-vinyl alcohol copolymers (a1) and (a2) is 5/95 to 95/5, and

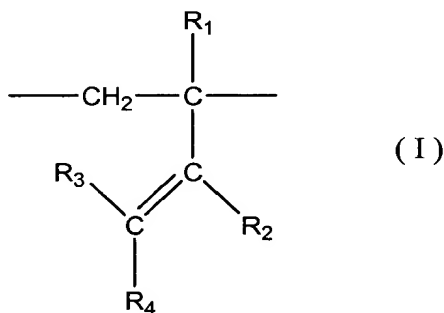
the thermoplastic resin (B) comprises a carbon-carbon double bond.

Claim 17 (Original): The resin composition of claim 16, wherein the transition metal salt (C) is contained in a ratio of 1 to 5000 ppm in terms of metal element, based on a total weight of the ethylene-vinyl alcohol copolymer (A) and the thermoplastic resin (B).

Claim 18 (Original): The resin composition of claim 16, wherein the transition metal salt (C) comprises at least one transition metal selected from the group consisting of iron, nickel, copper, manganese, and cobalt.

Claim 19 (Original): The resin composition of claim 16, wherein the thermoplastic resin (B) comprises a carbon-carbon double bond in a ratio of 0.0001 eq/g or more.

Claim 20 (Original): The resin composition of claim 16, wherein the thermoplastic resin (B) comprises a unit represented by formula (I)



wherein R₁ is a hydrogen atom or an alkyl group having 1 to 5 carbon atoms, R₂ is a hydrogen atom, an alkyl group having 1 to 10 carbon atoms, an aryl group, an alkylaryl group, an arylalkyl group or an alkoxy group, R₃ and R₄ are each independently a hydrogen atom, an alkyl group having 1 to 10 carbon atoms, an aryl group that can be substituted, -COOR₅, -OCOR₆, an cyano group or a halogen atom, and R₅ and R₆ are each independently an alkyl group having 1 to 10 carbon atoms, an aryl group, an alkylaryl group, an arylalkyl group or an alkoxy group.

Claim 21 (Currently Amended): The resin composition of claim 16, wherein a number average molecular weight of the thermoplastic resin (B) is 1000 to 500000.

Claim 22 (Original): The resin composition of claim 16, wherein the thermoplastic resin (B) comprises an aromatic vinyl compound unit and a diene compound unit.

Claim 23 (Original): The resin composition of claim 22, wherein the diene compound unit is at least one of an isoprene unit and a butadiene unit.

Claim 24 (Original): The resin composition of claim 22, wherein the aromatic vinyl compound unit is a styrene unit.

Claim 25 (Original): The resin composition of claim 22, wherein the thermoplastic resin (B) is a block copolymer.

Claim 26 (Original): The resin composition of claim 16, wherein the thermoplastic resin (B) is a styrene-isoprene block copolymer.

Claim 27 (Currently Amended): The resin composition of ~~claims~~ claim 16, wherein a difference in refractive index between the ethylene-vinyl alcohol copolymer (A) and the thermoplastic resin (B) is 0.01 or less, and wherein the refractive index of the ethylene-vinyl alcohol copolymer (A) is an average that is calculated based on the weight ratio of the at least two kinds of ethylene-vinyl alcohol copolymers (a1) and (a2).

Claim 28 (Original): The resin composition of claim 16, wherein particles of the thermoplastic resin (B) are dispersed in a matrix of the ethylene-vinyl alcohol copolymer (A).

Claim 29 (Original): A resin composition comprising ethylene-vinyl alcohol copolymer (A), a thermoplastic resin (B) other than the ethylene-vinyl alcohol copolymer (A), and a transition metal salt (C), wherein

the ethylene-vinyl alcohol copolymer (A) is contained in an amount of 70 to 99.9% by weight and the thermoplastic resin (B) is contained in an amount of 0.1 to 30% by weight,

the ethylene-vinyl alcohol copolymer (A) comprises at least two kinds of ethylene-vinyl alcohol copolymers (a1) and (a2),

ethylene contents ETa1 (mol%) and ETa2 (mol%) and degrees of saponification SDa1 (%) and SDa2 (%) of the ethylene-vinyl alcohol copolymers (a1) and (a2), respectively, satisfy the following equations (3) to (6):

$$25 \leq \text{ETa1} \leq 55 \quad (3)$$

$$90 \leq \text{SDa1} < 99 \quad (4)$$

$$25 \leq \text{ETa2} \leq 55 \quad (5)$$

$$99 \leq \text{SDa2} \quad (6),$$

a weight ratio (a1/a2) of the ethylene-vinyl alcohol copolymers (a1) and (a2) is 5/95 to 95/5,

the thermoplastic resin (B) comprises a carbon-carbon double bond, and

an oxygen absorption rate of the resin composition is $0.01 \text{ ml/m}^2 \cdot \text{day}$ or more.

Claim 30 (Original): A multilayered structure comprising at least one layer made of the resin composition of claim 2.

Claim 31 (Original): A multilayered container comprising at least one layer made of the resin composition of claim 2 and at least one thermoplastic polyester layer.

Claim 32 (Original): The multilayered container of claim 31, wherein two thermoplastic polyester layers are arranged so as to be in direct contact with both surfaces of the layer made of the resin composition.

Claim 33 (Original): A coinjection blow molded container having a multilayered structure, in which two thermoplastic polyester layers are arranged so as to be in direct contact with both surfaces of a layer made of the resin composition of claim 2.

Claim 34 (Original): A multilayered structure comprising at least one layer made of the resin composition of claim 16.

Claim 35 (Original): A multilayered container comprising at least one layer made of the resin composition of claim 16 and at least one thermoplastic polyester layer.

Claim 36 (Original): The multilayered container of claim 35, wherein two thermoplastic polyester layers are arranged so as to be in direct contact with both surfaces of the layer made of the resin composition.

Claim 37 (Original): A coinjection blow molded container having a multilayered structure, in which two thermoplastic polyester layers are arranged so as to be in direct contact with both surfaces of a layer made of the resin composition of claim 16.

SUPPORT FOR THE AMENDMENTS

This Amendment amends Claims 4, 7, 21 and 27. Support for the amendments is found in the specification and claims as originally filed. In particular, support for Claims 7 and 21 is found in the specification at least at page 52, line 23 ("number average molecular weight"). Support for Claim 27 is found in the specification at least at page 23, lines 5-15. No new matter would be introduced by entry of these amendments.

Upon entry of these amendments, Claims 1-37 will be pending in this application. Claims 1, 2 15, 16 and 29 are independent.

REQUEST FOR RECONSIDERATION

Applicants respectfully request entry of the foregoing and reexamination and reconsideration of the application, as amended, in light of the remarks that follow.

The present invention provides a resin composition comprising ethylene-vinyl alcohol copolymer ("EVOH") (A) and an additional thermoplastic resin (B). In addition to having good gas barrier properties against oxygen (i.e., low permeability), the resin composition has good oxygen scavenging properties (i.e., good oxygen absorption properties). The oxygen absorption properties result from the presence of oxygen-reactive carbon-carbon double bonds in the thermoplastic resin (B).

In the present invention, the carbon-carbon double bond encompasses conjugated double bonds, but does not encompass multiple bonds contained in aromatic rings. Specification at page 16, lines 2-4.

The resin composition can also contain a transition metal salt (C), which improves the oxygen scavenging function of the resin composition by facilitating the reaction of carbon-carbon double bonds with oxygen .

Claims 1-3, 14-17, 27-30 and 34 are rejected under 35 U.S.C. § 102(e) over U.S. Patent No. 5,972,447 ("Hata"). Hata discloses an EVOH copolymer resin with superior gas

barrier properties. However, Hata is silent about the oxygen absorption properties of resins and about resins containing carbon-carbon double bonds that can enhance oxygen absorption. Thus, Hata fails to suggest the limitation of independent Claims 1, 2 and 29 that "an oxygen absorption rate of the resin composition is $0.01 \text{ ml/m}^2 \cdot \text{day}$ or more" and the limitation of independent Claims 15-16 and 29 that "the thermoplastic resin (B) comprises a carbon-carbon double bond". Because Hata fails to disclose all the limitations of the claimed invention, the rejection over Hata should be withdrawn.

Claims 1, 15 and 29 are rejected under 35 U.S.C. § 102(b) over EP 0 814 126 ("EP-126"). In addition, Claims 1-16 and 19-37 are rejected under 35 U.S.C. § 103(a) over EP-126 in view of U.S. Patent No. 6,294,609 ("Bertin"). Claims 17-18 are rejected under 35 U.S.C. § 103(a) over EP-126 in view of EP 0 854 166 ("EP-166").

EP-126 discloses a polymer composition (C), with good barrier properties to gases, that comprises as main components an EVOH copolymer (A) and a block copolymer (B), which has a polymer block containing an aromatic vinyl monomer unit and a polymer block containing an isobutylene unit. EP-126 at abstract. Although EP-126's block copolymer (B) containing an aromatic vinyl monomer is unsaturated, it does not include a carbon-carbon double bond. As discussed above, the specification emphasizes that an aromatic ring does not contain carbon-carbon double bonds.

EP-126 discloses that the polymer composition (C) can also include another polymer, such as isoprene rubber or butadiene rubber, "within an extent not substantially impairing the effects of the present invention". EP-126 at page 8, lines 9-13. EP-126 also discloses that

... [A] composition obtained by mixing an ethylene-vinyl alcohol base copolymer with a flexible resin tends to substantially lose the barrier properties which the copolymer originally has. EP-126 at page 2, lines 14-15.

Because the inclusion of isoprene or butadiene rubber in EP-126's polymer composition (C) in amounts sufficient to raise oxygen absorption to $0.01 \text{ ml/m}^2 \cdot \text{day}$ or more

would negatively impact the gas barrier properties of EP-126's polymer composition (C), EP-126 fails to suggest the limitation of independent Claims 1, 2 and 29 that "an oxygen absorption rate of the resin composition is $0.01 \text{ ml/m}^2 \cdot \text{day}$ or more".

Furthermore, because EP-126's polymer composition does not contain a transition metal salt, EP-126 fails to suggest the limitation of independent Claims 15-16 and 29 of a "resin composition comprising ... a transition metal salt (C)".

Bertin is cited for disclosing "utilizing EVOH with two different saponification degrees as well as two different ethylene contents alters the permeability barrier property of the composition." Office Action at page 6, section 9, lines 15-17. However, Bertin fails to remedy the deficiencies of EP-126.

EP-166 discloses a composition for scavenging oxygen comprises an ethylenically unsaturated hydrocarbon polymer and a transition metal catalyst. EP-166 at abstract. However, because, as discussed above, EP-126 discloses that adding flexible resins to EVOH causes the EVOH to lose the barrier properties that EP-126 desires, there is no motivation to combine the ethylenically unsaturated polymer of EP-166 with EP-126. Furthermore, there is no reasonable expectation that the combination of EP-166's transition metal catalyst with EP-126's polymer composition would result in the oxygen absorption rate of the present invention.

Thus, the various rejections over one or more of EP-126, Bertin and EP-166 should be withdrawn.

Claims 7, 21 and 27 are rejected under 35 U.S.C. 112, second paragraph. To obviate the rejection, Claims 7, 21 and 27 are amended.

In view of the foregoing amendments and remarks, Applicants respectfully submit that the application is in condition for allowance. Applicants respectfully request favorable consideration and prompt allowance of the application.

Should the Examiner believe that anything further is necessary in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' representative at the telephone number listed below.

Respectfully submitted,

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